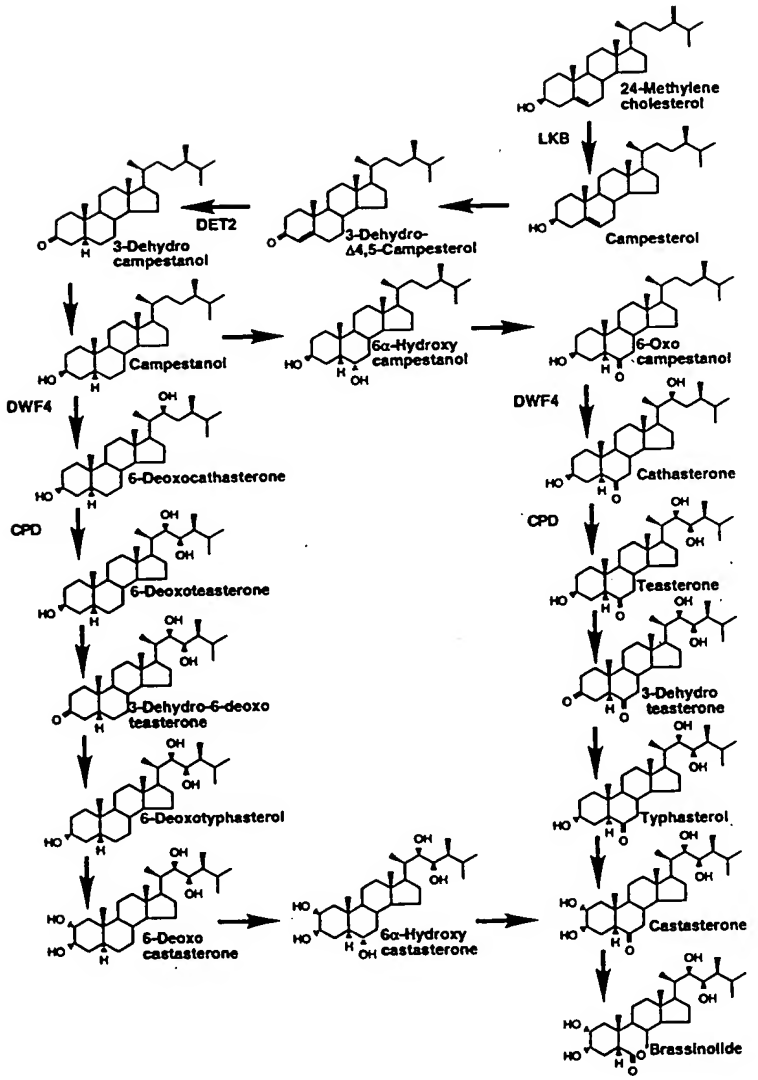

24-Methylene cholesterol
LKB
Campesterol
DET2
3-Dehydro campestanol
3-Dehydro-Δ4,5-Campesterol
Campestanol
6α-Hydroxy campestanol
6-Oxo campestanol
DWF4
6-Deoxocathasterone
DWF4
Cathasterone
CPD
6-Deoxoteasterone
CPD
Teasterone
3-Dehydro-6-deoxo teasterone
3-Dehydro teasterone
6-Deoxotyphasterol
Typhasterol
6-Deoxo castasterone
6α-Hydroxy castasterone
Castasterone
Brassinolide

FIG. 1

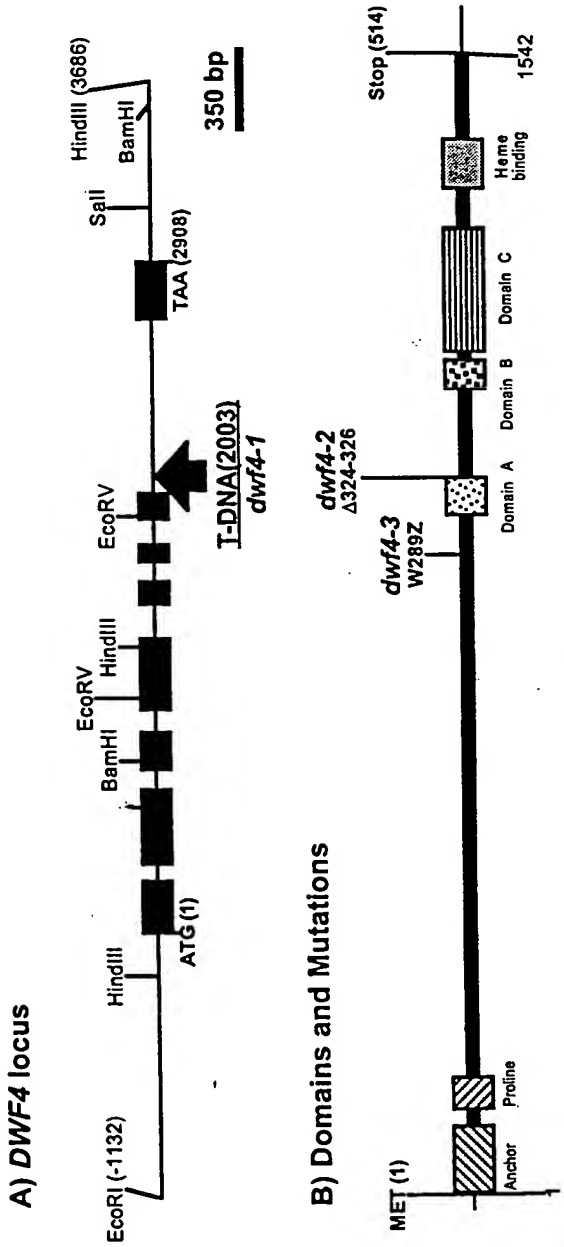
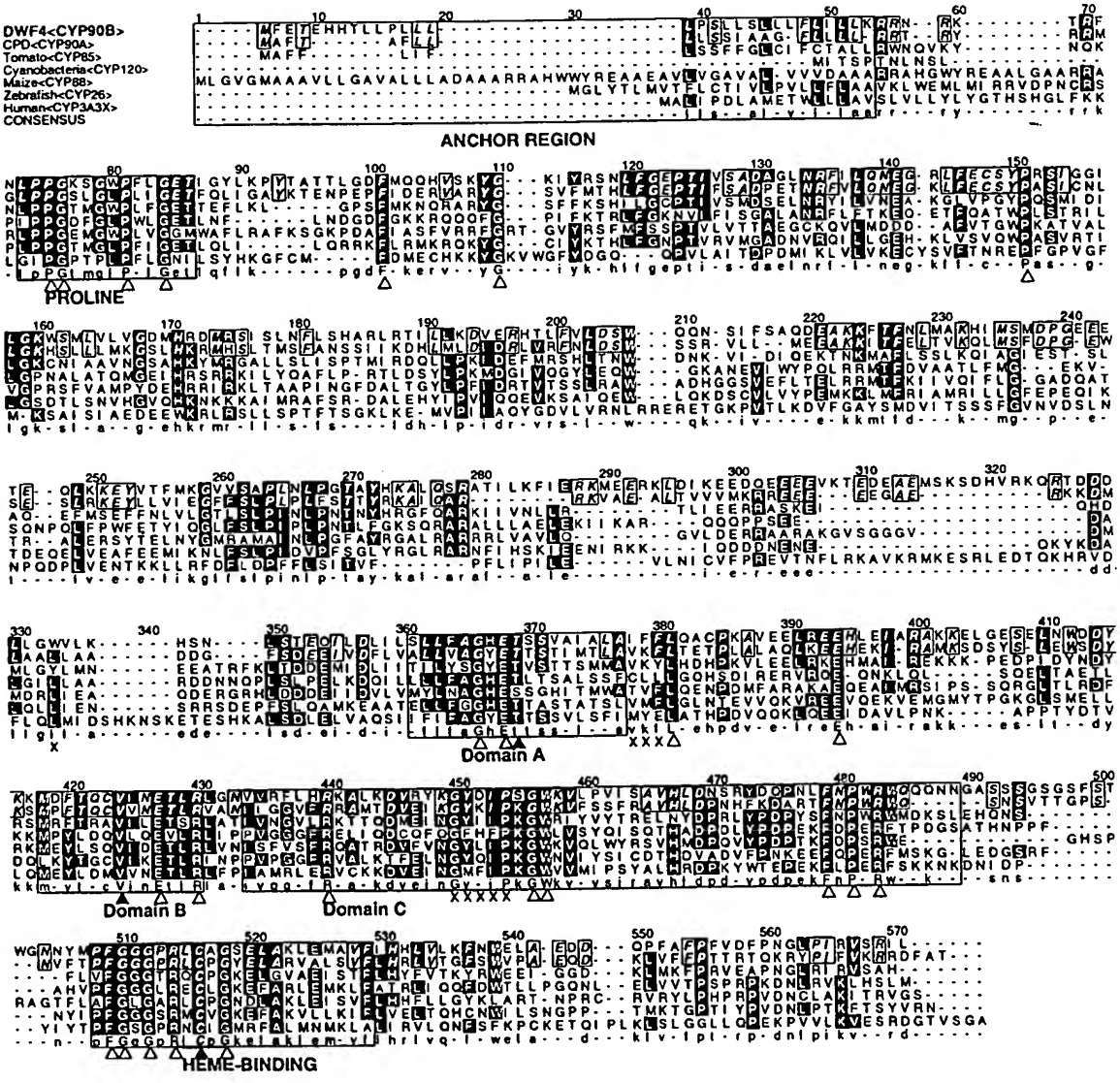

A) DWF4 locus
EcoRI (-1132)
HindIII
ATG (1)
BamHI
EcoRV
HindIII
EcoRV
T-DNA(2003)
dwf4-1
SalI
TAA (2908)
BamHI
HindIII (3686)
350 bp
B) Domains and Mutations
MET (1)
Anchor
Proline
dwf4-3
W289Z
dwf4-2
Δ324-326
Domain A
Domain B
Domain C
Heme binding
Stop (514)
1542

FIG. 2


DWF4<CYP90B>
CPD<CYP90A>
Tomato<CYP85>
Cyanobacteria<CYP120>
Maize<CYP88>
Zebrafish<CYP26>
Human<CYP3A3X>
CONSENSUS
ANCHOR REGION
PROLINE
Domain A
Domain B
Domain C
HEME-BINDING

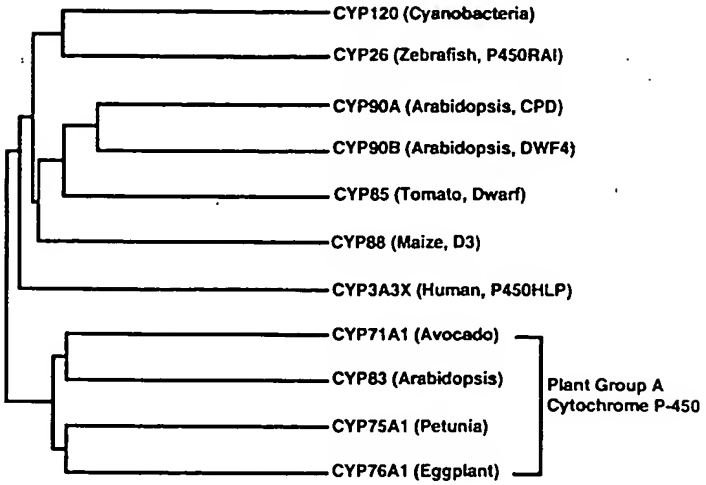

CYP120 (Cyanobacteria)
CYP26 (Zebrafish, P450RAI)
CYP90A (Arabidopsis, CPD)
CYP90B (Arabidopsis, DWF4)
CYP85 (Tomato, Dwarf)
CYP88 (Maize, D3)
CYP3A3X (Human, P450HLP)
CYP71A1 (Avocado)
CYP83 (Arabidopsis)
CYP75A1 (Petunia)
CYP76A1 (Eggplant)
Plant Group A
Cytochrome P-450

FIG. 4

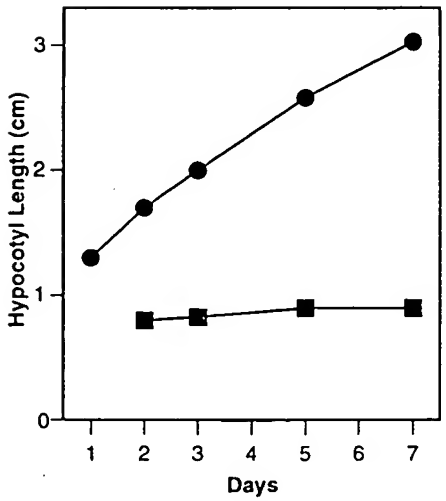

Hypocotyl Length (cm)
0
1
2
3
1
2
3
4
5
6
7
Days

FIG. 5

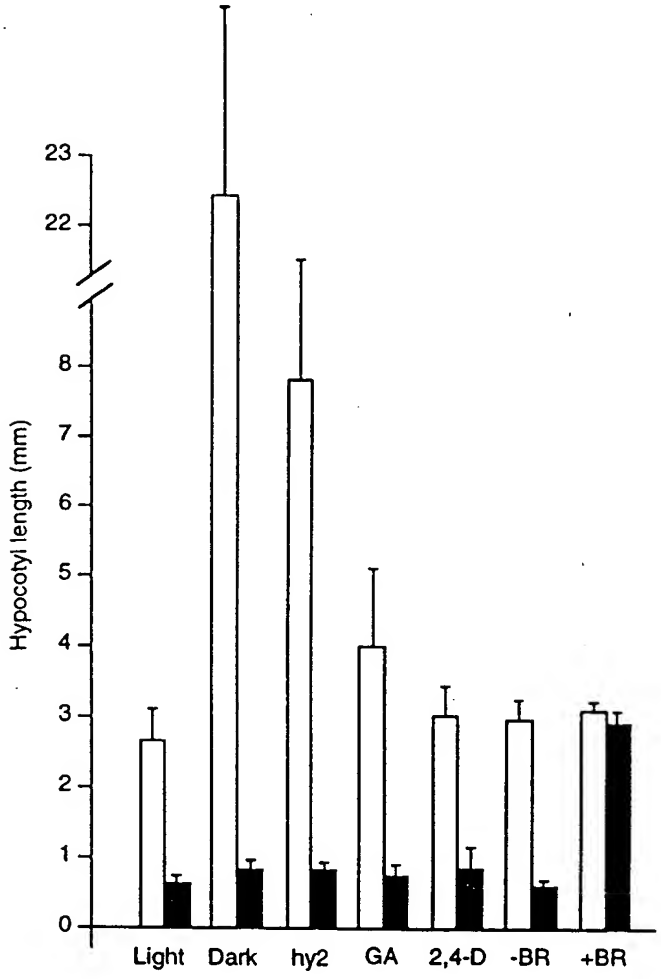

Hypocotyl length (mm)
23
22
8
7
6
5
4
3
2
1
0
Light
Dark
hy2
GA
2,4-D
-BR
+BR

FIG. 6

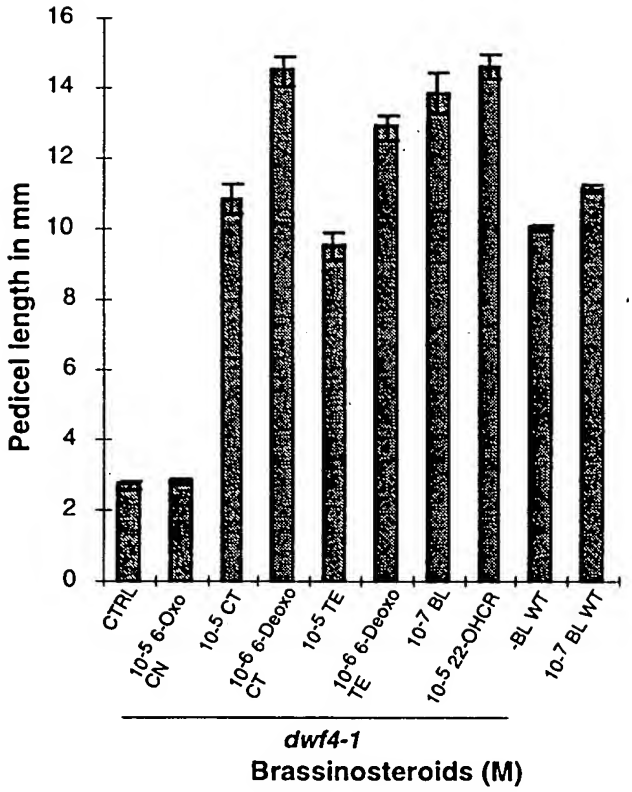

16
14
12
10
8
6
4
2
0
Pedicel length in mm
CTRL
10-5 6-Oxo CN
10-5 CT
10-6 6-Deoxo CT
10-5 TE
10-6 6-Deoxo TE
10-7 BL
10-5 22-OHCR
-BL WT
10-7 BL WT
dwf4-1
Brassinosteroids (M)

FIG. 7

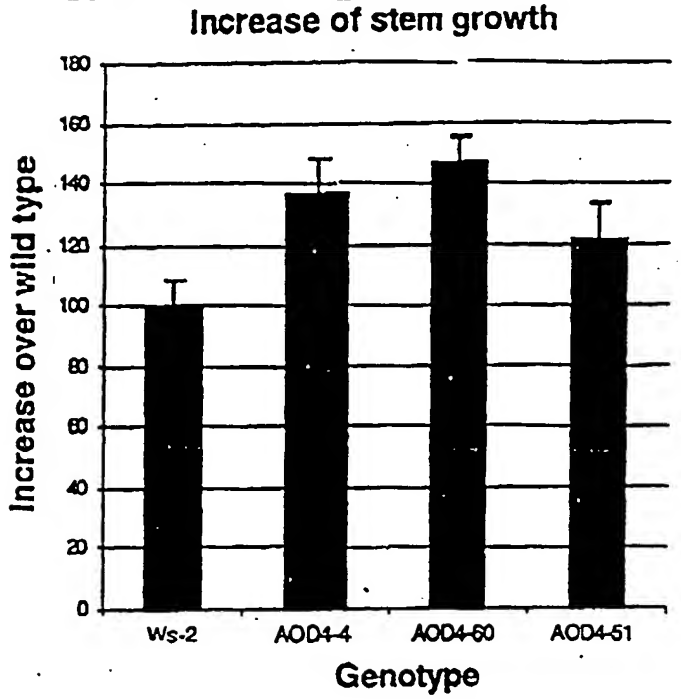

Increase of stem growth
Increase over wild type
180
160
140
120
100
80
60
40
20
0
Ws-2
AOD4-4
AOD4-60
AOD4-51
Genotype

FIG. 8

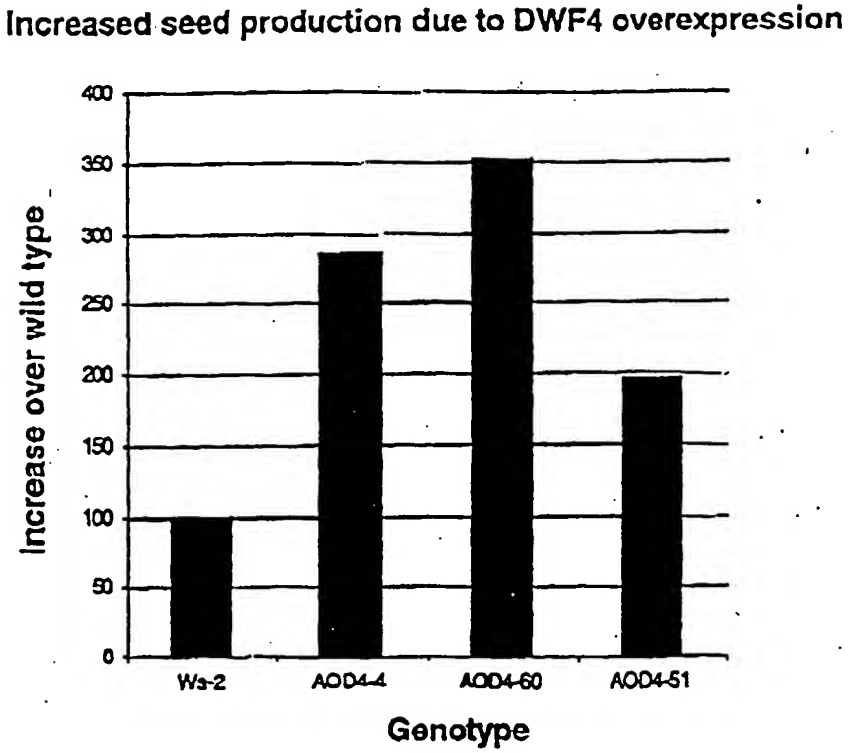

Increased seed production due to DWF4 overexpression
Increase over wild type
400
350
300
250
200
150
100
50
0
Ws-2
AOD4-4
AOD4-60
AOD4-51
Genotype

FIG. 9

1 ATGTGGGTATTATATTGTTGGGTTCGGTTTGAGCTACAATATAAATTTCGTGTTTCTGGT 60

61 TATTCTGTTCACATGATTTGAGTTTGGTTCTCAATTTGGATTCCAAGATAATTAAATATT 120

121 AAAATTCATTTAAAATATTTACAAGTAATTAATTATCTTTACATTGTATTGTTATAACAA 180

181 AATATCTATCTTTGGTATATGAGAAAATATGGAGTTTGGAATTTATAATAATAAAGGAAA 240

241 TAATCGATTCCATTTGGTTGGATTACACAGTTAAGTTTTTGTGTTTCTTTTGTTATATGT 300

301 ATATGAGTAAATCAAAAAGAGTATTGATTGAAGTGTAAACATATTTCGTTATGACCCCCA 360

361 AAAAAAAAAAAAAAAACAAACAAACAAACCCCCCCCCCGATATAGTTTTTGGTTCTGGATT 420

421 AGGTTTATTTGATCATAATTACATGCATCATTTCTTTGATTACTATGAAGATTTTCTTAC 480

481 CAATTAAAATTTCGAATTCATATCTCTTGATTATTAAATTAAATACGAGTGTGAATATCC 540

541 GTTTATCGATCACTCCAATCATGATTATGATTCTTGTGCTAATCCAGCAAATTATTAACA 600

601 AGAGTATTGAGAAAAAACCGAAAATAAGAAAAGGGAAAGAGTAGTGACCCATGGAGTATG 660

661 TGAATAATTATCAAAGAGAATAAGAGATGACAACCAAAAGGTTGTGGAATAATGGTCCCT 720

721 GCCAGCTTTCTCTCACAATCAATATCGACCCTATTTGGATTTTCTGGATATTCGTTAAAA 780

781 TTTGCGATAACGATTGTGAAAAATATTTTATTTGTTAGCTGATCTCAATATTATGTTCCA 840

841 GGTATTTGCATAATCTTCTGTTTAAAGCATATTTTGTCTTTCTTTTTGTTTCGTTTCTCT 900

901 TAACTATATATTATCGCGGATATATGATAACAATGATATATCACAAAACAATTGTCTGGG 960

961 ACCATTTTGAATAAACTTTTTCTCAAACATTACGGGACACTGGACTCGACCCTTAAAATA 1020

FIG 10A

1021 CGATTTTACAGCGTCACTAGTTGAGATTACTAGCATAAAGCATAAAGGACCCGTTCAAGC 1080

1081 TATTTATACAAAGTTACAAACTGAATATAGCTTGAAATCCTTTAGAAAATTTTGGAATTA 1140

1141 CCGGTTGTTATGTAAATATAGATTTAGTGGTAAACAAATATGTTAATCAATTAGTGGTCA 1200

1201 ACATATACATAATTCCTTACAGAAAAAACAAACTTAAGAGAAGTTAACATATCCATATAT 1260

1261 GGGTATGCTATACCTTTCACGTATGCTATACTAGAGACTAAAGAATAGTTATGTGATGTC 1320

1321 GATAAATGAAATTCACACGCGTGGTAATAATTATGGGACCGTATGTTACGATCACTGCAA 1380

1381 ATATCATTCTTGGTTGGTCAACAATAAAAACAAAAACAAGAAAAAAAGAAAACGATTTTT 1440

1441 CTTGGATTCCATTCAATGATCTAAAATGCATAGATCTTTTGGGTTACAGTTTCGAAGTCC 1500

1501 TCTACAAGCGTGTAACCATCTGCAACTATTAAATTGCTTTCTTTAATGCATCTTTAACAT 1560

1561 ATTTATTGTTAGTTGGAATTTAATAAGAGCGAACTTGTAACATTACAATATTTATATTAG 1620

1621 ATACTAGTATGTGATTATTCCAAATACATACTTTGGATGTTTAAACTTAATCTTGTTTCT 1680

1681 TCCTACGGTATAAATATTAATCATCGAGGTAAAAAAAAGTTTTGTCTTATTTTCGCGATGC 1740

1741 ATGAAGGATAAACCTAATGACTTTAATTTTTTGAAAATGTAACCCTTTTACTCATAGATT 1800

1801 AATTACCGTATGTTTTTGTTGCCATAATGACAGCCTCTACAACTGTGATAGTCAATTTTT 1860

1861 TCTGCAAATATTAAATTAGGAATTCAATGCTACTATCAATAGAAGAAACAGCTGAGTATT 1920

1921 ACATTTTAATTTAAAGACAAAATTTTTGAAAAATGTTATAATTTCTAACAATATTATTAA 1980

1981 AATATGATGCCTATAATGTATTTCCTATGTTCTTAAAATATTTTTTTTTATATTTAGTTA 2040

2041 TAAATACATTATGAACCAATAATAGTTGGTGAATTCAAATATCTCCATTAATATTTTTTG 2100

FIG 10B

2101 AAATCTACAAATTATTAATATTTAGTCAATAACAATGCATAGAAAGTTCCAAAAAAAATT 2160

2161 TTGTTAACAGAAACTTCCAAATTTTTTTTTTTATGGAACAAGAAATAACAGATAGAAAA 2220

2221 CTATTTTGTTGTGGAATGGAAGTAGTAATATACATTAAGCAAATTTTAAAAAATTATATA 2280

2281 AGCCTATACGCGCTCAAAGTATGTTATCTAGTAGGTGTAATTAATAATGCATGGTGCGAT 2340

2341 TCAGAATTGGGACAACAATGAAAACGGAATTAAAATATTAACTTTAAAATAAATAAAAAT 2400

2401 TTGAGTAAATGTGTTTTCTGACTATTGAGGGGCAAAAAAAAAGACAATGCCAAAAGTCTAC 2460

2461 GGGTTTGACTGTCCAGTTCGGTAATAATCTAATAACTCTGTCTTTGACCGCACGCTCGTG 2520

2521 TAGGGGTCCTTCTGACATTTTCACTGTTCTACCCCTACTCGTGAGCCCACCCTTTTCCCA 2580

2581 TATCCTAAGGGTAATTTTGGAAATCCCAATTTAAACCGATTGAGACCGTACCGGACTTCC 2640

2641 TGGGATTCTGCTGGAGCATTTATCAAAAATTATTAGCACGAATGGGTTTATTAATTTAAA 2700

2701 AACTCACAACTTGATCAGATAAAATTTCATAAACACTTTTACGATGGATTCGTACGATCT 2760

2761 ATCTAATGACTTTTTTTTTTCTACCACGGTGGATGAAAGTTATAGTACTATTAGCCAGAG 2820

2821 ACAATTGATTATAGATATATCCATTAATCCATGATATTTATGATATAAATAGCTGTTAAA 2880

2881 CTATTTCAGCATCGCAGCTTTCTGCAACTTTTGTTTTTAATTTAAGAGTTTAATAAATAA 2940

2941 AAGTATTAAAAGGAGCATAACGAGGCAACAAAAGTAATGAACACGGAGAAACAAAAGCCA 3000

3001 TGAAGCTCATTGGTTAGTTTAAGCTTAATAAGAAGATTTTATTAAATTTTAATGACGATG 3060

3061 ATAACAATTATATTTTCTGACTTCTTTAAAACCCCCTCTTACAAACAGAAGCTCCCTTTT 3120

3121 TCAGTAGAAGTCCGATTCCCAATCTTAAAGACAAAGCCATTAGAAAGAGAAAGTGAGTGA 3180

FIG 10C

3181 GAGAGAGAGAGAAACTAGCTCCATGTTCGAAACAGAGCATCATACTCTCTTACCTCTTCT 3240
exon 1

3241 TCTTCTCCCATCGCTTTTGTCTCTTCTTCTCTTCTTGATTCTCTTGAAGAGAAGAAATAG 3300

3301 AAAAACCAGATTCAATCTACCTCCGGGTAAATCCGGTTGGCCATTTCTTGGTGAAACCAT 3360

3361 CGGTTATCTTAAACCGTACACCGCCACAACACTCGGTGACTTCATGCAACAACATGTCTC 3420

3421 CAAGTAAACAACAACATCTTCCAAAAACTCAAAAAAATAAATCCTCTGTTTTTGAAATTT 3480

3481 GACTAATGTTGTTTATTTTACAGGTATGGTAAGATATATAGATCGAACTTGTTTGGAGAA 3540
exon 2

3541 CCAACGATCGTATCAGCTGATGCTGGACTTAATAGATTCATATTACAAAACGAAGGAAGG 3600

3601 CTCTTTGAATGTAGTTATCCTAGAAGTATAGGTGGGATTCTTGGGAAATGGTCGATGCTT 3660

3661 GTTCTTGTTGGTGACATGCATAGAGATATGAGAAGTATCTCGCTTAACTTCTTAAGTCAC 3720

3721 GCACGTCTTAGAACTATTCTACTTAAAGATGTTGAGAGACATACTTTGTTTGTTCTTGAT 3780

3781 TCTTGGCAACAAAACTCTATTTTCTCTGCTCAAGACGAGGCCAAAAAGGTTTTTATTTTT 3840

3841 ATCTTTTATTTTGCTAAATTTTTTTGTTTATGAATCTTTAGAGTTTCTAACTTTTTTTTT 3900

3901 TTTAATTGAACAGTTTACGTTTAATCTAATGGCGAAGCATATAATGAGTATGGATCCTGG 3960

3961 AGAAGAAGAAACAGAGCAATTAAAGAAAGAGTATGTAACTTTCATGAAAGGAGTTGTCTC 4020

4021 TGCTCCTCTAAATCTACCAGGAACTGCTTATCATAAAGCTCTTCAGGTACATTTATTTTT 4080

4081 TTTTGCTGTAAAGTCACAAACTCTCATTATAGGTTTTTAATTTTATTTTATGTGTTAAAT 4140

4141 AAAATATCTAAAATGGTTGTGTAGTCACGAGCAACGATATTGAAGTTCATTGAGAGGAAA 4200

4201 ATGGAAGAGAGAAAATTGGATATCAAGGAAGAAGATCAAGAAGAAGAAGAAGTGAAAACA 4260

FIG 10D

4261 GAGGATGAAGCAGAGATGAGTAAGAGTGATCATGTTAGGAAACAAAGAACAGACGATGAT 4320

4321 CTTTTGGGATGGGTTTTGAAACATTCGAATTTATCGACGGAGCAAATTCTCGATCTCATT 4380

4381 CTTAGTTTGTTATTTGCCGGACATGAGAcTTCTTCTGTAGCCATTGCTCTCGCTATCTTC 4440

4441 TTCTTGCAAGCTTGCCCTAAAGCCGTTGAAGAGCTTAGGGTAAGATAATTATAACAGCAC 4500

4501 AAGTTAATTACTACCAAATTGTTACGTATTATATAAGTTATTATAGAATTATTCTATTAG 4560

4561 AATATACGATGAAAAAAGTATGTATATTTAATTGTCACTAATTTTATGTTTATTGATTTA 4620

4621 TACTTTTGAAGGAAGAGCATCTTGAGATCgCGAGGGCCAAGAAGGAACTAGGAGAGTCAG 4680

4681 AATTAAATTGGGATGATTACAAGAAAATGGACTTTACTCAATGTGTATGTTACTATCATT 4740

4741 CTCATTATTTATTCTATGTTCATATGATTTATGATGAAACCAAAATTATTGATTTTTTTT 4800

4801 TTGGTGTGTGTGAAGGTTATAAATGAAACTCTTCGATTGGGAAATGTAGTTAGGTTTTTG 4860

4861 CATCGCAAAGCACTCAAAGATGTTCGGTACAAAGGTAAAACTTTACGTACAAAATTTTTA 4920

4921 AATAATGAAATCCGGAATATTGAAATCTTATTGGATGAAAAATATTAAAATAATTTACAT 4980

4981 TTCTTAATGTTGGAAAAAAGGATACGATATCCCTAGTGGGTGGAAAGTGTTACCGGTGAT 5040

5041 CTCAGCCGTACATTTGGATAATTCTCGTTATGACCAACCTAATCTCTTTAATCCTTGGAG 5100

5101 ATGGCAACAGGTAAATAAAAAGTTTCTCTCGTTAACTATCGAAAATTAGTGTATAGTTTT 5160

5161 TTCATCTATTGCATGAATAGATACGTCCTACGTGATTTACCTATCTATAGATACTATACG 5220

5221 AGAACTATTAATCTGGCAAAAACTTTTTATTATTATTATCTTTCAAGTTAGATCTTAACA 5280

5281 CGTCATGGATCATTGATCACATGAAAGCATATAAATTAAAAATAAGAGAGAGAAAGAGAC 5340

FIG 10E

5341 GTGTTGGTGTAAGTGTACGTGAAGACAATTAATTAGTAGGATGGTATGTCTTTAATGACG 5400

5401 TAGGAGCTGCCTAAATATTCTTATAATCGTGACCGTTGATTTATTATTAGTCACGGCTTT 5460

5461 GATACAATTTAAGATTTGACGGACGATGGTACCACGGCTTTGACGGATCTCACACGCCCG 5520

5521 ATGACTTGTACGTGCGTTAGATTCTGCCACGTTGACTGGTTTTAATACTTAGATTTATAA 5580

5581 CTCTATTAATTATAACAACTATCAAATCGGCGAATTAGAGAAATATACTATATAGTATTA 5640

5641 TTATGATTATTATGAGATAATACTTTATGAAATAAGATAATAATGGTAGTCATGATGTTA 5700

5701 TAGTGAGTGGGGAAGGTAAGAGGTGGTGAGAGATGATTAATGACCCCACGTGGTGTGGTG 5760

5761 CCAACAAGCACGTGTTCTTCTTCCTTTTTTCTTCCCAACTTCTTTTTTTGGGGGTTTATT 5820

5821 GTGATTTATAAAATCGGTTTGTCGTTTTTTTTTGTGACGAGCAGCAAAACAACGGAGCGT 5880

exon 8

5881 CATCGTCAGGAAGTGGTAGTTTTTCGACGTGGGGAAACAACTACATGCCGTTTGGAGGAG 5940

5941 GGCCAAGGCTATGTGCTGGTTCAGAGCTAGCCAAGTTAGAAATGGCAGTGTTTATTCATC 6000

6001 ATCTAGTTCTTAAATTCAATTGGGAATTAGCAGAAGATGATCAACCATTTGCTTTTCCTT 6060

6061 TTGTTGATTTTCCTAACGGTTTGCCTATTAGGGTTTCTCGTATTCTGTAAAAAAAAAAAA 6120

6121 AGATGAAAGTATTTTTATTCTCTTCTTTTTTTTTTGATAATTTTAAATCATTTTTTTTGC 6180

6181 CCAATGATATATAAAAATTTGGATAAATAATATTATTGGATATTCGTTTTTTAGTTCGGG 6240

6241 TTTGAGAAAAGGGTTTCGACTTTCGAAAGTGGACGATGTATATAGATTGGGAGCTAGGTT 6300

6301 GAGTCTTTGGACATTTGTATTGGATGTTGTTGATTATTAGTGTCGACACTATTAAACCTT 6360

6361 AAATGGGCTTTCTATAAGGCCCAATTATATTACGATTATAACAAAGTGACAACTTTTACT 6420

FIG 10F

6421 TCGTTTTTGATCCGAAGCAATAACAAATTGTCAAATACCAAACACAAGAATTATGTAAAC 6480

6481 ACTCGTGTGTGTCTAGTGGGAAATCATTGGGCTGGAGACTGAACATCAGAACACAAGAAA 6540

6541 CCTGTCAATTATGGATACACCTCCTATGACGGTTTCCAAACTTTATCTTGATTCTTATCG 6600

6601 TGTTACATTGACACAAAGAGTTAGGTGTCAAAAGGACTAAATGAATAACAATAGCTCTCA 6660

6661 GGATAAGAAGGTTCATAAAATGGTTTCTTTATTTTGAGAAGAAAGAGAGAGGAGCTTTTA 6720

6721 CTGTTTCTTGGGTCCTATTCCTTTAAATGAGAGGGTTTCGTTTTTACTTCTTCTATCTCA 6780

6781 TCATCTTTAGGATCCTCTTCTAGACGAGTAAAGTAATCCTCGTTACCAAGCAATGGTCTC 6840

6841 ATCTTTTGAAGACAGGTCTTTTCCAAGTCCTAGTTCAGGCCAAAGCTT 6888

FIG 10G

```
  1 MFETEHHTLL PLLLLPSLLS LLLFLILLKR RNRKTRFNLP PGKSGWPFLG ETIGYLKPYT
 61 ATTLGDFMQQ HVSKYGKIYR SNLFGEPTIV SADAGLNRFI LQNEGRLFEC SYPRSIGGIL
121 GKWSMLVLVG DMHRDMRSIS LNFLSHARLR TILLKDVERH TLFVLDSWQQ NSIFSAQDEA
181 KKFTFNLMAK HIMSMDPGEE ETEQLKKEYV TFMKGVVSAP LNLPGTAYHK ALQSRATILK
241 FIERKMEERK LDIKEEDQEE EEVKTEDEAE MSKSDHVRKQ RTDDDLLGWV LKHSNLSTEQ
301 ILDLILSLLF AGHETSSVAI ALAIFFLQAC PKAVEELREE HLEIARAKKE LGESELNWDD
361 YKKMDFTQCV INETLRLGNV VRFLHRKALK DVRYKGYDIP SGWKVLPVIS AVHLDNSRYD
421 QPNLFNPWRW QQQNNGASSS GSGSFSTWGN NYMPFGGGPR LCAGSELAKL EMAVFIHHLV
481 LKFNWELAED DQPFAFPFVD FPNGLPIRVS RIL
```

FIG. 11

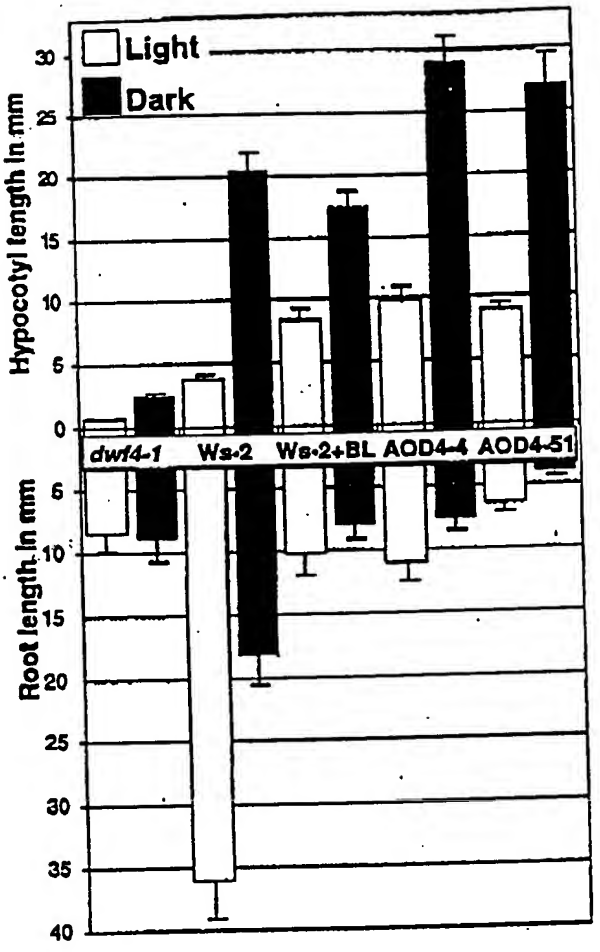


FIG. 12